

Smallest Monthly Rain-falls.—Burkes, Ariz., trace; Vail, Ia., and Breckenridge, 0.05 inches; Phoenix, Ariz., and Omaha, 0.07 in.; Fredericksburg, Uvalde and Brackettsville, Tex., 0.08 in.; Ft. Lyon, Cal., and Eagle Pass, Tex., 0.10 in.; St. Paul, Minn., 0.11 in.; Castroville, Tex., and Plattsmouth, Neb., 0.12 in.; Ft. Leavenworth, Kan., 0.14 in.; Wickenburg, Ariz., Bismarck, Emerson and De Soto, Neb., 0.15 in.; Tabor, Ia., 0.19 in.; Ft. Garland, Col., 0.18 in.; Genoa, Neb., Ft. Dodge, Ia., and Camp Verde, Ariz., 0.20 in.; Yankton, Dak., 0.23 in.; Pilot Point, Tex., 0.24 in.; Olivet, Dak., 0.25 in.; Coucho, Tex., 0.26 in.; Cheyenne, 0.32 in.

Floods.—The only floods reported were occasioned by ice gorges, and are noticed under the head of navigation.

Hail.—Denison, Tex., 8th; St. Meinrad, Ind., 15th; Springfield, Mass., 9th; Plattsmouth, Neb., 27th; Princeton, N. J., 8th, 17th, 23rd; Troy, N. Y., 27th; Pikes Peak, 30th; Breckenridge, Minn., 24th; San Antonio, Tex., 26th.

Rainy Days.—The number of days on which rain or snow has fallen varies, as follows: New England, 7 to 20; Middle States, 7 to 19; South Atlantic States, 5 to 12; Gulf States, 6 to 17; Ohio valley and Tennessee, 14 to 20; Lower Lake region, 10 to 22; Upper Lake region, 8 to 18; Upper Mississippi valley, 4 to 9; Lower Missouri valley, 4 to 7; Eastern slope, 3 to 14; Rocky Mountains, 4 to 10; Western Plateau, 11 to 15; Pacific coast, 8 to 14.

Cloudy Days.—For New England, the number varies from 8 to 20; Middle States, 6th to 18th; South Atlantic States 5 to 20; Gulf States, 4 to 21; Ohio valley and Tennessee, 7th to 17th; Lower Lake region, 14 to 25; Upper Lake region, 7 to 21; Upper Mississippi valley, 3 to 12; Lower Missouri valley, 3 to 12; Eastern slope, 5 to 18; Rocky Mountains, 2 to 10; *Western Plateaus*, 6 to 15; Pacific coast, 5 to 10.

Snow.—The precipitation northeast, north and west of the Ohio valley, occurred generally as snow. On the Pacific coast, and in the Gulf and South Atlantic States it occurred, as follows: In *British Columbia* on the 5th and 8th. *Oregon*, 15th. *California*, on the coast mountains, 28th, and Sacramento, 13th. *Texas*, 4th, 5th, 6th, 8th to 11th. *Louisiana*, 3rd, 4th, 5th. *Mississippi*, 4th, 5th, 9th. *Alabama*, 4th, 5th. *Georgia*, 4th, 5th. *North Carolina*, 8th, 19th.

Snow from a cloudless Sky.—Newbury, Vt., 16th, (6.30 p. m.) sky was perfectly clear and yet for about twenty minutes there was a continuous fall of snow, the flakes were large, but very thin and transparent, sky was sufficiently clear that the zodiacal light shone with considerable brilliancy; Burlington, Vt., 14th, snow fell with sky so clear that stars were plainly visible.

Depth of snow on Ground at end of Month.—It varied in depth in the different sections as follows: *New England*, from trace in Connecticut to 36 inches in Maine and on Mt. Washington. *Middle States*, 0 to 3 inches along the coast, to 27 inches in the interior. *Ohio*, 0 to 16 inches. *Lower Lakes*, 0 to 30 inches. *Upper Lakes*, 0 to 18 inches. *Upper Mississippi valley*, 0 to 1 inch. *Illinois*, 3 to 12 inches. *Red river of the North valley*, $\frac{1}{2}$ to 5 inches. *Missouri*, 4 to 5 inches. *Dakota*, 0 to 1 inch, and snow drifts. *Rocky Mountains*, 0 at Santa Fe to 10 inches at Virginia City. *Western Plateaus*, trace at Winnemucca to 7 inches at Pioche and 4 inches at Salt Lake City.

RELATIVE HUMIDITY.

The average percentage of relative humidity for the month ranges as follows: New England, 59 to 76; Middle Atlantic States, 63 to 80; South Atlantic States, 65 to 81; East Gulf States, 41 to 80; West Gulf States, 73 to 85; Lower Lakes, 73 to 82; Upper Lakes, 71 to 77; Ohio valley and Tennessee, 62 to 77; Upper Mississippi valley, 69 to 79; Lower Missouri valley, 62 to 76; Red River of the North valley, 85 to 88; Eastern Slope, 61 to 82; Western Plateau, 60 to 73; California, 64 to 73. *High stations* report the following, not corrected for altitude: Mt. Washington, 85; Pike's Peak, 40; Cheyenne, 61; Virginia City, 63; Denver, 52; Santa Fe, 55.

WINDS.

The prevailing winds at the Signal Service stations are shown by arrows on chart No. II, from an examination of which it will be seen that the prevailing winds of the month were very generally from north to west, except along the Gulf coast and in central Texas, where they were southerly.

Total Movements of the Air.—The following are the *largest* monthly movements recorded at the Signal Service stations, viz: Pike's Peak, 18,496 miles; Cape May, 15,376; Sandy Hook, 13,982; Thatcher's Island, 13,704; Wood's Holl, 13,216; Cape Lookout, 13,136; Kittyhawk, 12,131; Barnegat, 10,860; Sandusky, 9,834; Milwaukee, 9,826; Indianola, 9,733; Eastport, 9,521. The *smallest* are: Visalia, Cal., 1,963 miles; Fredericksburg, Tex., 2,208; Uvalde, Tex., 2,589; Dubuque, Iowa, 2,600; Nashville, 2,763; Shreveport, 2,894; Lynchburg, 3,122; Virginia City, Mont., 3,165; Fort Davis, Tex., 3,330; Boise City, Idaho, 3,442; San Antonio, Tex., 3,471; Indianola, 3,570; Augusta, Ga., 3,594.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather Indications with the telegraphic reports for the succeeding twenty-four hours, show the general percentage of omissions to be 0.6 per cent., and of verifications to be 86.2 per cent. The percentage of verifications for the four elements have been: weather, 90.9; wind, 83.2; temperature, 86.2; barometer, 84.6. The percentage of verifications by geographical districts have been: New England, 85.5; Middle States, 86.0; South Atlantic States, 88.6; East Gulf

States, 87.0; West Gulf States, 83.5; Lower Lake Region, 87.0; Upper Lake Region, 88.1; Tennessee and the Ohio Valley, 86.3; Upper Mississippi Valley, 85.6; Lower Missouri Valley, 84.6. Of the 3,698 predictions that have been made, 122 or 3.3 per cent. are considered to have entirely failed; 177 or 4.8 per cent. were one-fourth verified; 356 or 9.6 per cent. were one-half verified; 303 or 8.2 per cent. were three-fourths verified; 2,741 or 74.1 per cent. were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary Signals.—167 Cautionary Signals were displayed, of which 140, or 83.8 per cent. were justified. 132 Cautionary Off-shore Signals were displayed, and of these 127 or 96.2 per cent. were justified as to direction; 118 or 89.4 per cent. were justified as to velocity. Of the Cautionary Off-shore Signals, 63 were changed from Cautionary. 299 signals of both kinds were displayed, of which 250 or 85.6 per cent. were fully justified. The above does not include signals ordered at 45 display stations where the velocity is only estimated and not measured. 110 cases were reported of winds of 25 miles or over where signals were not ordered; in only eight of these cases did the velocity reach 40 miles.

NAVIGATION.

In the table, on right side of chart No. III, are given the highest and lowest readings, on the Signal Service river-gauges, during the month, with dates of same. On the 15th the *Tennessee*, at Chattanooga, was five feet above the danger-line, and on the 19th and 29th, respectively, the *Cumberland*, at Nashville, and the *Ohio*, at Pittsburg, rose within a few inches of the danger-line.

Ice on Rivers and Lakes.—*Missouri*—Leavenworth, 31st, river frozen over during entire month, ice about 20 inches thick, heavily loaded teams crossed daily. *Mississippi*—Minneapolis, Minn., 31st, ice in river 26 inches thick. La Crosse, 31st, river frozen over during month. Dubuque, 29th, ice in river weak and porous from recent high temperatures and travel across entirely ceased. Keokuk, 31st, wagons and foot passengers crossed the river on ice during nearly the entire month. St. Louis, 1st, river frozen solid above the bridge but clear in harbor to the south of it; 2d, river frozen, thin ice running in harbor; 3d, 4th, river frozen; 5th, river closed in harbor excepting a narrow channel one-fourth of a mile wide, south of bridge, ferries stopped running; 6th to 24th, river frozen; 25th, ice decaying; 26th, ferries and tug-boats broke up gorge in river, river clear from the bridge south to Carondelet; 27th, river remained the same south of the bridge, ferries and tug-boats breaking gorge north of bridge, ice quite rotten; 28th, gorge north of bridge partially broken up, very little ice running in river, heavy ice loosened from above in the evening; 29th, slush ice running in river, but clear north of bridge; 30th very little slush ice in river; 31st, heavy floating ice in river, steamer arrived in the afternoon from Cairo, navigation resumed. Cairo, river remained frozen to the 26th, breaking up in the evening; 30th, entirely clear of ice; navigation closed from December 28th, 1878, to January 30th, 1879. Memphis, 1st to 4th, 10th, 12th to 16th, floating ice in river; 14th, 16th to 27th, drift wood in river. Pt. Pleasant, La., 6th to 15th, floating ice in river. *Verdigris River*—Independence, Ia., 27th, ice broke up; 28th, river very high. *Arkansas*—Fort Gibson, 2d, river frozen over; 23d, ice all passed out of river; 27th, river rising rapidly and filled with floating ice and drift-wood. *Ohio*—Pittsburg, 3d, river frozen over; 24th, ice-gorge in river; 27th, ice-gorge broken up, navigation open. Wellsburg, W. Va., 2d, river frozen over; 19th, ice started at 6:50 p. m., moved down about 100 feet and stopped, started again at 7:50 p. m., and run until about 11 p. m. 20th, ice started about 8 a. m. Cincinnati, 1st, floating ice in river, two boats left for Pomeroy, no arrivals; 2d, new ice covered the river, ice gorged for a short time, boats laid up, two arrivals, one from Kentucky river and one from Pomeroy; 3d, crossing river on ice five miles above station, ice gorged at many places between Aurora and Maysville; river closed in front of city at night; 4th, skating on river, ice gorged above and below city; 6th, skating and crossing on ice; 10th, ice in river still intact, rapid rise in the Kanawha, Guyan and Big Sandy rivers, and destruction of considerable floating property; many tug-boats employed in breaking up the ice in river near city; 11th, tug-boats breaking up the ice, pedestrians crossing on the ice; 12th, people crossing on ice, up to a late hour ice remained intact; 13th, river rising rapidly, ice broke at 4 p. m., ice running heavily and several gorges forming, very little damage done; 14th, heavy ice passing all day; 15th, heavy ice running until noon, navigation resumed; 16th, river rising, heavy ice passing; 17th, river falling, heavy ice passing; 18th, river rising, heavy shore-ice passing all day, ice in the Licking river began running out; 19th, river rising, very little ice passing, boats arriving report navigation very difficult and damaging the wheels, Licking river still running out, ice well broken up; 20th, river rising, heavy ice passing in the channel, in some instances twenty feet thick; 21st, river rising, very little ice passed, but in very large "bergs"; 22d, river falling, very large "bergs" running in morning, but very little ice in afternoon; 24th, river rising, very heavy ice passed on Ohio side in morning, navigation resumed from Parkersburg to New Orleans; 25th, river rising, floating ice in river; 26th, river rising, heavy ice passing in morning but disappearing in afternoon; 27th, river rising, scarcely any-ice visible; 28th, river rising heavy ice passing all day; 29th, heavy ice passing all day thinning out some in the evening; 31st, river rising, no ice passed to-day. Cairo, 1st to 14th, heavy floating ice in river extending from shore to shore; 15th, 18th, about clear of ice; 13th, ice gorged in river above Paducah; 18th, Paducah, ice-gorge broke this morning; 20th, 21st, drift-wood in river; 22d, ten wrecks (barges and flat-boats) passed station during the day, caused by heavy floating ice; 19th to 22d, heavy floating ice in river; 23d to 25th, ice extending from Illinois shore to middle of river only; 26th to 31st, entirely clear of ice; navigation closed from December 25th, 1878, to January 26th, 1879; damage caused to shipping by heavy floating ice estimated at \$65,000. Louisville, 2nd, freezing along shore; 3d, river frozen over above station; 6th, river frozen over except in current; 14th, ice in river breaking up; 15th, ice-gorge passed station, carrying away several canal barges and driving a steamboat ashore; 22d, small quantities of floating ice in river;